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Original article

## Surgical management of hyperthyroidism



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### ABSTRACT

**Aims:** Hyperthyroidism includes several clinical and histopathological situations. Surgery is commonly indicated after failure of medical treatment. The aim of this study was to analyze the indications and complications of surgery as well as endocrine results.

**Materials and methods:** Patients operated on for hyperthyroidism between 2004 and 2012 were included in a retrospective study. Total thyroidectomy was performed for Graves' disease, toxic multinodular goiter and amiodarone-associated thyrotoxicosis; patients with toxic nodule underwent hemithyroidectomy. Pathologic analysis assessed surgical specimens; postoperative complications and resolution of hyperthyroidism were noted.

**Results:** Two hundred patients from 15 to 83 years old were included. One hundred and eighty-eight underwent primary surgery and 12 were re-operated for recurrent goiter (6 with subtotal thyroidectomy for multinodular goiter 25 years previously; 6 with hemithyroidectomy for solitary nodule 15 years previously). Eighty-two patients suffered from toxic multinodular goiter, 78 from Graves' disease, 35 from solitary toxic nodules and 5 from amiodarone-associated thyrotoxicosis. Fourteen papillary carcinomas (including 11 papillary microcarcinomas) and 34 healthy parathyroid glands (17%) were identified in the pathological specimens. Postoperative complications comprised 4% permanent recurrent laryngeal nerve palsy (1 year follow-up), 9% hematoma requiring surgical revision, and 3% definitive hypocalcemia. Normalization of thyroid hormone levels was observed in 198 patients. Two recurrences occurred due to incomplete resection (1 case of Graves' disease and 1 intrathoracic toxic goiter that occurred respectively 18 and 5 months after resection). Postoperative complications were more frequent in multinodular goiter (23%) than in Graves' disease (13%) (ns:  $P > 0.05$ ).

**Conclusion:** Surgical management of hyperthyroidism enables good endocrinal control if surgery is complete. Patients need to be fully informed of all possible postoperative complications that could occur, especially vocal ones. Long-term follow-up is necessary to detect recurrence, which can occur more than 20 years after partial thyroidectomy surgery. Surgery allows early diagnosis of 12.5% of papillary carcinomas.

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### 1. Introduction

Hyperthyroidism is defined as excessive secretion of iodinated thyroid hormones: triiodothyronine (T3) and thyroxine (T4). The associated target tissue disorders are known as thyrotoxicosis. Asthenia, weight-loss, anxiety, palpitations and thermophobia are

the main symptoms [1]; associated with goiter or exophthalmia, they are suggestive of this metabolic disorder.

Hyperthyroidism affects 1–3% of the general population: 2% of female and 0.2% of male subjects [1]. Anatomico-clinical situations vary: the most frequent is Graves' disease, accounting for 50–80% of cases [2].

Other causes comprise toxic multinodular goiter (MNG), toxic adenoma and amiodarone-associated hyperthyroidism.

Several treatment options are available, depending on the pathology involved: synthetic anti-thyroid drugs (SATDs), radioactive iodine, percutaneous ethanol injection, or surgery.

Treatment choice has long been controversial. The risk of postoperative complications such as hypocalcemia [3], hematoma or recurrent laryngeal nerve palsy (RLNP) [4] following total

Abbreviations: SATDs, synthetic anti-thyroid drugs; MNG, multinodular goiter; RLNP, recurrent laryngeal nerve palsy; STT, subtotal thyroidectomy; TT, total thyroidectomy.

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**Table 1**  
Preoperative demographic data.

	n (%)	Gender F/M	Age (years)	Primary surgery		Secondary surgery	
				n	Age	n	Age
MNG	82 (41%)	33/8	55.7	65 (79%)	55	17 (21%)	61
Graves' disease	78 (39%)	34/5	38.7	40 (51%)	41	38 (49%)	36.5
Solitary nodule	35 (17.5%)	26/9	48.8	29 (83%)	48	6 (17%)	53.8
Amiodarone	5 (2.5%)	1/4	63.2	5 (100%)	63.2	0	
Total	200	4/1	51.6	139 (69.5%)	51.8	61 (30.5%)	50.4

MNG: multinodular goiter; n: number of cases.

thyroidectomy (TT) is classically elevated in case of hyperthyroidism, but surgery provides faster and more stable remission of endocrine disorder than conservative strategies [1], and also earlier detection of thyroid cancer associated with endocrinopathy [5]. Surgery is therefore a treatment of choice, notably following failure of primary medical treatment (usually SATDs and/or radioactive iodine) [1].

The present study sought to analyze indications for and complications associated with surgery, and endocrine results according to pathology.

## 2. Materials and methods

A retrospective study included patients operated on for hyperthyroidism by a single surgeon between 2004 and 2012. TT was performed for Graves' disease, toxic goiter and amiodarone-associated hyperthyroidism, and lobo-isthmectomy for toxic nodule.

Two hundred patients (38 male [19%], 162 female [81%]), mean age 48 years (range, 15–83 years), were included over the 8-year period. In 139 cases (69.5%), surgery was primary, and in 61 (30.5%) secondary to either medical treatment or prior surgery.

Table 1 presents the main demographic data.

SATDs were prescribed in first intention except for patients poorly tolerating this medication or requiring urgent surgery, in which case beta-blockers were used.

Surgery was in all cases performed under general anesthesia with intubation. Inferior laryngeal nerve monitoring was not systematically used. Redon drains were systematically fitted until postoperative D2.

Hospital stay was systematically for 48 hours. Preoperative and postoperative nasofibroscopy (D2 and 1 month) were performed in all cases. In patients with postoperative laryngeal immobility, a minimum one-year of follow-up was achieved.

Calcemia was systematically assessed by D1, D2, D7 and D14, and at 2 months if not normal by D14.

All thyroidectomy specimens underwent pathologic analysis searching for resected parathyroid gland and thyroid carcinoma.

Transient and definitive hypocalcemia, RLNP (definitive if persistent at 12 months), hematoma requiring surgical revision and recurrent endocrinopathy were recorded.

Statistical analysis used Chi<sup>2</sup> or Fisher exact test; the significant threshold was set at 0.05.

## 3. Results

Surgical strategy was determined by various factors: desire for pregnancy, carbimazole-induced agranulocytosis, compressive signs, suspect cytology, and ophthalmopathy.

Twelve of the 61 patients for whom surgery was deferred (6%) had had previous procedures: 6 subtotal thyroidectomies (STT) for goiter 25 years before index surgery, and 5 lobo-isthmectomies for solitary nodule 15 years or, in 1 case, 30 years before index surgery.

Forty-nine (24.5%) were operated on following medical failure (23 with recurrence at a mean 5 years; 18 failures of ongoing medical treatment including 5 cases of carbimazole-induced agranulocytosis). Eight patients had previously received  $\geq 1$  dose of iodine 131. Fig. 1 presents the factors for treatment strategy.

Pathologic specimen analysis detected 25 malignant lesions (12.5%): 3 papillary thyroid carcinomas (1.5%) and 22 papillary microcarcinomas (11%). A healthy parathyroid gland was resected in 17% of cases (34 patients). Table 2 shows pathology results.

Table 3 presents the main complications.

There were no deaths during follow-up.

Of the 18 patients (9%) with postoperative hematoma, 17% were on anticoagulation treatment compared to 13% of patients without (ns:  $P = 0.6$ ).

RLNP was noted in 4 patients preoperatively and a further 13 postoperatively, 5 of whom recovered normal laryngeal motion within the year. Two patients had laryngeal diplegia: unilateral laser cordectomy was performed on the day of primary surgery in 1 case and 1 month later in the other; no tracheotomy was required. Six months after surgery, clinical evaluation noted intelligible voice, with 1 mobile vocal fold and the other immobile in a paramedian position. In the other patient bilateral palsy and dysphonia was noted at 1 year. There was no RLNP in patients undergoing revision surgery for compressive hematoma.

Twenty percent of patients had hypocalcemia by D2, definitive in only 3%; 9% of patients with resected parathyroid gland developed definitive hypocalcemia; preserved parathyroid gland was associated with 2% definitive hypocalcemia; the difference, however, was non-significant ( $P > 0.05$ ).

After surgery, 2 cases of recurrence were noted (1% of patients): 1 of Graves' disease after STT, and 1 intrathoracic nodule left after MNG resection 5 months previously.

## 4. Discussion

### 4.1. Treatment indications

In thyrotoxicosis, hyperthyroidism requires rapid treatment to avoid recurrence and allow amiodarone treatment if necessary. Strategy depends on pathology, health status and acceptable risk [1].

In Europe, SATDs are the first-line attitude in Graves' disease. They are usually effective, but only within 4–6 weeks, and require prolonged treatment, cross-placental and lacteal barriers and may exceptionally (<1%) induce agranulocytosis [1]. Above all, long-term efficacy is only moderate, with a 50% relapse rate at 1 year [6].

Radioactive iodine may be a first-line attitude in Graves' disease and small MNG [1], and is the second-line treatment of choice after failure of SATDs in Graves' disease. However, it is limited by numerous contraindications, and the rate of failure is estimated at 21% [7].

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